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United States
Department of
Agriculture

Soil
Conservation
Service



Washington Basin Outlook Report January 1, 1993

January 1, 1993

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Basin Outlook Reports

and Federal - State - Private Cooperative Snow Surveys

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How forecasts are made

Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are combined with snowpack data to prepare runoff forecasts. Streamflow forecasts are coordinated by Soil Conservation Service and National Weather Service hydrologists. This report presents a comprehensive picture of water supply conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data, and narratives describing current conditions.

Snowpack data are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation and temperature are monitored on a daily basis and transmitted via meteor burst telemetry to central data collection facilities. Both monthly and daily data are used to project snowmelt runoff.

Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed the most probable forecast 50% of the time. Similarly, the actual streamflow volume can be expected to exceed the 90% forecast volume 90% of the time. The same is true for the 70%, 30%, and 10% forecasts. Generally, the 90% and 70% forecasts reflect drier than normal hydrologic and climatic conditions; the 30% and 10% forecasts reflect wetter than normal conditions. As the forecast season progresses, a greater portion of the future hydrologic and climatic uncertainty will become known and the additional forecasts will move closer to the most probable forecast.

All programs and services of the USDA Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Interpreting Streamflow Forecasts

Introduction

Each month, five forecasts are issued for each forecast point and each forecast period. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences. Water users need to know what the different forecasts represent if they are to use the information correctly when making operational decisions. The following is an explanation of each of the forecasts.

Most Probable (50 Percent Chance of Exceeding) Forecast. This forecast is the best estimate of streamflow volume that can be produced given current conditions and based on the outcome of similar past situations. There is a 50 percent chance that the streamflow volume will exceed this forecast value. There is a 50 percent chance that the streamflow volume will be less than this forecast value.

The most probable forecast will rarely be exactly right, due to errors resulting from future weather conditions and the forecast equation itself. This does not mean that users should not use the most probable forecast; it means that they need to evaluate existing circumstances and determine the amount of risk they are willing to take by accepting this forecast value.

To Decrease the Chance of Having Too Little Water

If users want to make sure there is enough water available for their operations, they might determine that a 50 percent chance of the streamflow volume being lower than the most probable forecast is too much risk to take. To reduce the risk of not having enough water available during the forecast period, users can base their operational decisions on one of the forecasts with a greater chance of being exceeded (or possibly some point in-between). These include:

70 Percent Chance of Exceeding Forecast. There is a 70 percent chance that the streamflow volume will exceed this forecast value. There is a 30 percent chance the streamflow volume will be less than this forecast value.

90 Percent Chance of Exceeding Forecast. There is a 90 percent chance that the streamflow volume will exceed this forecast value. There is a 10 percent chance the streamflow volume will be less than this forecast value.

To Decrease the Chance of Having Too Much Water

If users want to make sure they don't have too much water, they might determine that a 50 percent chance of the streamflow being higher than the most probable forecast is too much of a risk to take. To reduce the risk of having too much water available during the forecast period, users can base their operational decisions on one of the forecasts with a smaller chance of being exceeded. These include:

30 Percent Chance of Exceeding Forecast. There is a 30 percent chance that the streamflow volume will exceed this forecast value. There is a 70 percent chance the streamflow volume will be less than this forecast value.

10 Percent Chance of Exceeding Forecast. There is a 10 percent chance that the streamflow volume will exceed this forecast value. There is a 90 percent chance the streamflow volume will be less than this forecast value.

Using the forecasts—an example

Using the Most Probable Forecast. Using the example forecasts shown below, users can reasonably expect 36,000 acre-feet to flow past the gaging station on the Mary's River near Deeth between March 1 and July 31.

Using the Higher Exceedance Forecasts. If users anticipate a somewhat drier trend in the future (monthly and seasonal weather outlooks are available from the National Weather Service every two weeks), or if they are operating at a level where an unexpected shortage of water could cause problems, they might want to plan on receiving only 20,000 acre-feet (from the 70 percent chance of exceeding forecast). In seven out of ten years with similar conditions, streamflow volumes will exceed the 20,000 acre-foot forecast.

If users anticipate extremely dry conditions for the remainder of the season, or if they determine the risk of using the 70 percent chance of exceeding forecast is too great, then they might plan on receiving only 5000 acre-feet (from the 90 percent chance of exceeding forecast). Nine out of ten years with similar conditions, streamflow volumes will exceed the 5000 acre-foot forecast.

Using the Lower Exceedance Forecasts. If users expect wetter future conditions, or if the chance that five out of every ten years with similar conditions would produce streamflow volumes greater than 36,000 acre-feet was more than they would like to risk, they might plan on receiving 52,000 acre-feet (from the 30 percent chance of exceeding forecast) to minimize potential flooding problems. Three out of ten years with similar conditions, streamflows will exceed the 52,000 acre-foot forecast.

In years when users expect extremely wet conditions for the remainder of the season and the threat of severe flooding and downstream damage exists, they might choose to use the 76,000 acre-foot (10 percent chance of exceeding) forecast for their water management operations. Streamflow volumes will exceed this level only one year out of ten.

UPPER HUMBOLDT RIVER BASIN								
STREAMFLOW FORECASTS								
FORECAST POINT	FORECAST PERIOD	<---DRIER--- FUTURE CONDITIONS ---WETTER--->						
		----- Chance of Exceeding -----						
		90%	70%	50% (Most Probable)	30%	10%	25 YR.	
		(1000AF)	(1000AF)	(1000AF) (% AVG.)	(1000AF)	(1000AF)	(1000AF)	
MARY'S RIVER nr Deeth	MAR-JUL	5.0	20.0	36	77	52	76	47
	APR-JUL	8.0	17.0	31	74	45	67	42
LAMOILLE CREEK nr Lamoille	MAR-JUL	6.0	16.0	24	79	32	43	31
	APR-JUL	4.0	15.0	22	75	30	41	30
NF HUMBOLDT RIVER at Devils Gate	MAR-JUL	6.0	12.0	43	73	74	121	59

For more information concerning streamflow forecasting ask your local SCS field office for a copy of "A Field Office Guide for Interpreting Steamflow Forecasts".

Washington Water Supply Outlook

January 1993

General Outlook

JANUARY 1, 1993: The snowpack varies from 94% in the Skagit River Basin to 164% in the Green Basin. Washington SNOTEL sites averaged 108% of normal snowpack on January 1 (BY JANUARY 8, THE STATEWIDE AVERAGE WAS 125%). December precipitation was 82% of normal state wide, and varied from 64% of average in the Walla Walla Basin to 100% in the Spokane Basin. Year-to-date precipitation varies from 94% in the Walla Walla to 74% in the Okanogan Basin. December temperatures were below normal and varied from 1 degree above in the Walla Walla Basin to 5 degrees below in the Yakima Basin. With the below normal temperatures in December, streamflows varied from 80% of normal on the Wenatchee River to 28% on the Walla Walla River. January 1 reservoir storage is generally poor throughout the state, with reservoirs in the Yakima Basin at 32% of average and 18% of capacity. Forecasts for 1993 runoff vary from 85% of average for the Snake River to 98% for the Spokane River

Snowpack

There were only a few manual snow courses read this month, so the majority of snowpack information comes from the SNOTEL system. The January 1st reading showed 108% and this increased to 116% by the 11th of January. Snowpack varies over the state, with the north being near normal and increasing to the Oregon border. The Green River Basin had the highest with 164% of average, and the Cowlitz-Lewis Basin had 160% of normal. The Skagit River Basin, with 94% of average, was the lowest. Snowpack along the east slopes of the Cascade Mountains includes the Yakima with 116%, and the Wenatchee 104%. Snowpack in the Okanogan is at 114%, and the Spokane at 118%. Maximum snow cover is at Paradise on Mount Rainier, with a water content of 31.8 inches. This site would normally have 28.9 inches of water content on January 1.

Precipitation

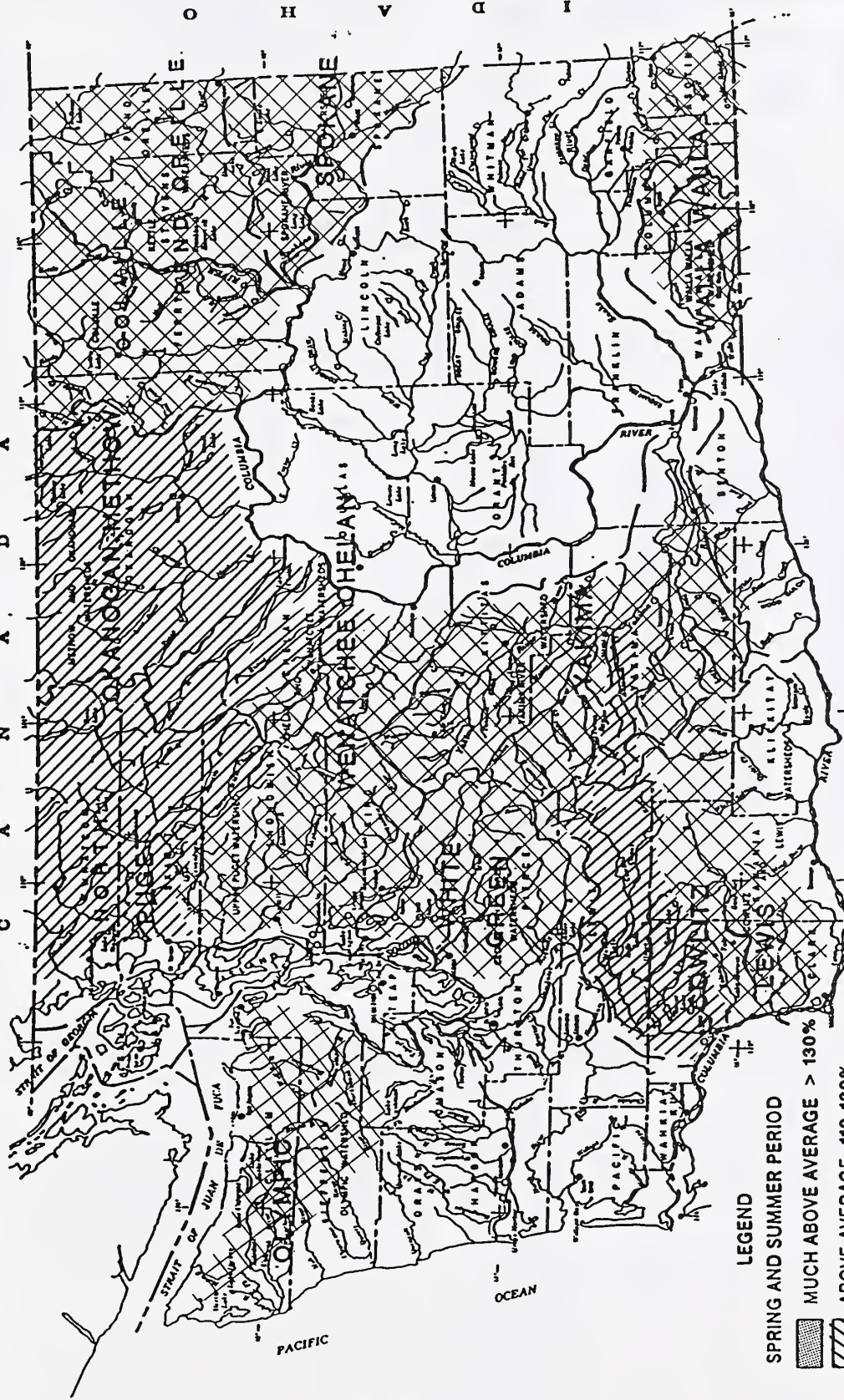
December precipitation reported from National Weather Service stations was 82% of average statewide. The year-to-date precipitation statewide is 83% and varied from 94% of normal in the Walla Walla Basin to 74% in the Okanogan-Methow Basin. December precipitation varied from 100% of average in the Spokane Basin, to 64% in the Walla Walla Basin. SNOTEL sites in Washington showed high elevation year-to-date precipitation values to be 87%. Maximum year-to-date precipitation was at the June Lake SNOTEL site near Mt. St. Helens, with 51.6 inches since October 1, 1991; normal for this site is 65.5 inches.

Reservoir

Reservoir storage in Washington is much below average for January 1. Cold weather has reduced the streamflow entering the reservoirs. Reservoir storage in the Yakima Basin was 187,100 acre feet, 32% of normal. Storage at other reservoirs include Roosevelt at 86% of average, and the Okanogan reservoirs at 89% of normal for January 1. The power generation reservoirs contain the following: Coeur d'Alene Lake, 44,500 acre feet, or 34% of normal; Chelan Lake, 335,700 acre feet, 89% of average and 51% of capacity, and Ross Lake at 87% of average, and 49% of capacity.

Streamflow

December streamflows were below average in Washington. The Wenatchee River at 80% was the highest and the South Fork Walla Walla River with 28% was the lowest in the state, . Other streamflows were the following percentage of normal: the Cowlitz River, 42%; the Okanogan River, 65%; the Spokane River, 45%; the Columbia at the Canadian border, 85%. and the Yakima River at Kiona 47%. Forecasts for summer streamflow are for below to near average and vary from 98% of average for the Spokane River to 85% of normal for the Snake River. January forecasts for some west side streams include: Cedar River, 94%; Green River, 91%; and the Dungeness River, 92%. Some east side streams include the Yakima River at Parker, 90%; the Wenatchee River at Peshastin, 91%; and the Colville River, 96%.



LEGEND

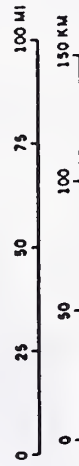
SPRING AND SUMMER PERIOD

- MUCH ABOVE AVERAGE > 130%
- ABOVE AVERAGE 110-130%
- NEAR AVERAGE 90-110%
- BELOW AVERAGE 70-90%
- MUCH BELOW AVERAGE < 70%
- NOT FORECAST
- WATERSHED BOUNDARY

JANUARY 1, 1993

STREAMFLOW PROSPECTS

WASHINGTON

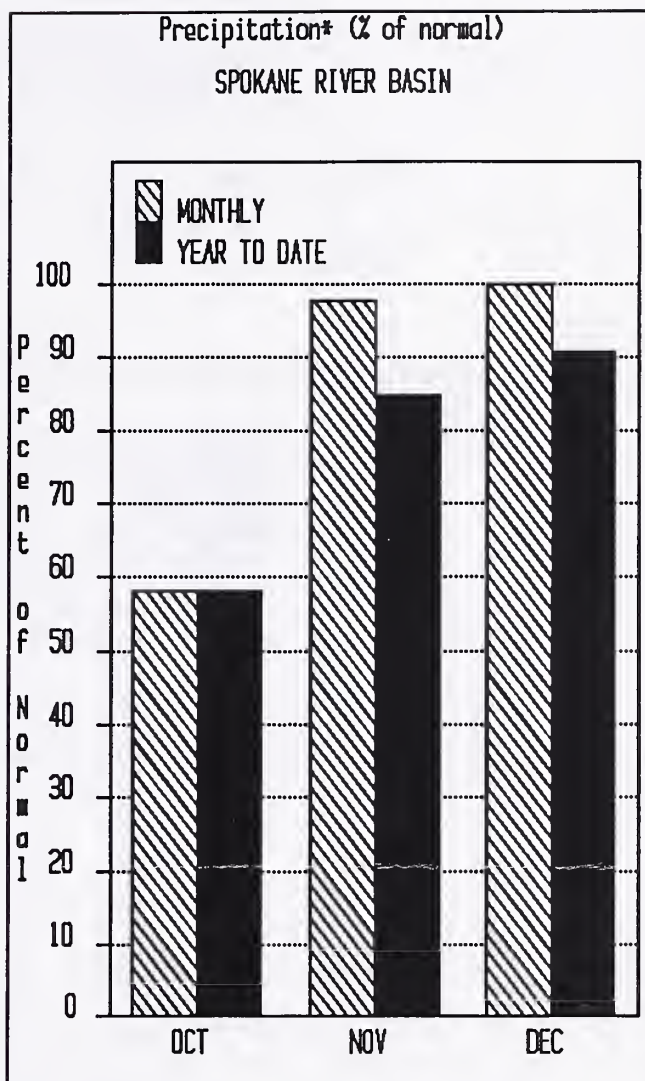
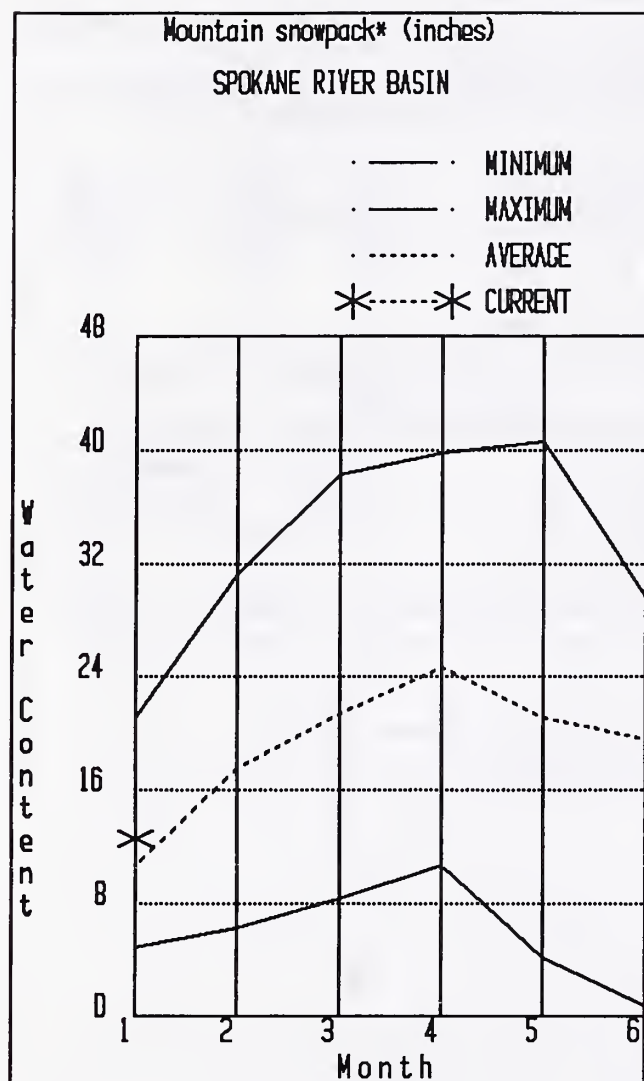


SOURCE: Data compiled by SCS
Field Personnel

JANUARY 1993

(d) Denotes discontinued site.

Spokane River Basin



*Based on selected stations

The January 1 forecasts for summer runoff within the Spokane River Basin are 98% of normal. The forecast is based on a snowpack that is 118% of average and a water year-to-date precipitation value of 91% of normal. Precipitation for December was 100% of average. Temperatures in the basin were 4 degrees below normal during December. Streamflow on the Spokane River was 45% of average for December. January 1 storage in Coeur d'Alene Lake was 44,500 acre feet, 34% of normal, and 19% of capacity.

For more information contact your local Soil Conservation Service office.

SPOKANE RIVER BASIN

Streamflow Forecasts - January 1, 1993

SPOKANE RIVER BASIN Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier -----		Future Conditions -----		----- Wetter ----->>		30-Yr Avg. (1000AF)
		-----		Chance Of Exceeding *		-----		
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
SPOKANE nr Post Falls (1,2)	APR-SEP	950	2090	2670	98	3250	4410	2720
	APR-JUL	785	2010	2570	98	3130	4360	2627
SPOKANE at Long Lake (2)	APR-JUL			2880	98			2937

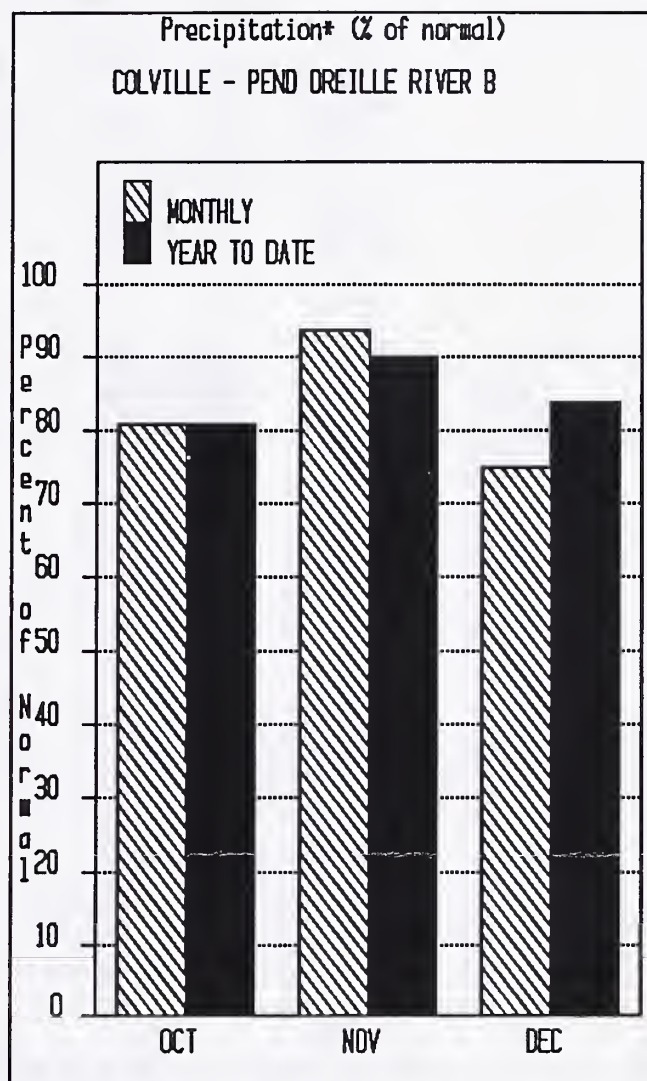
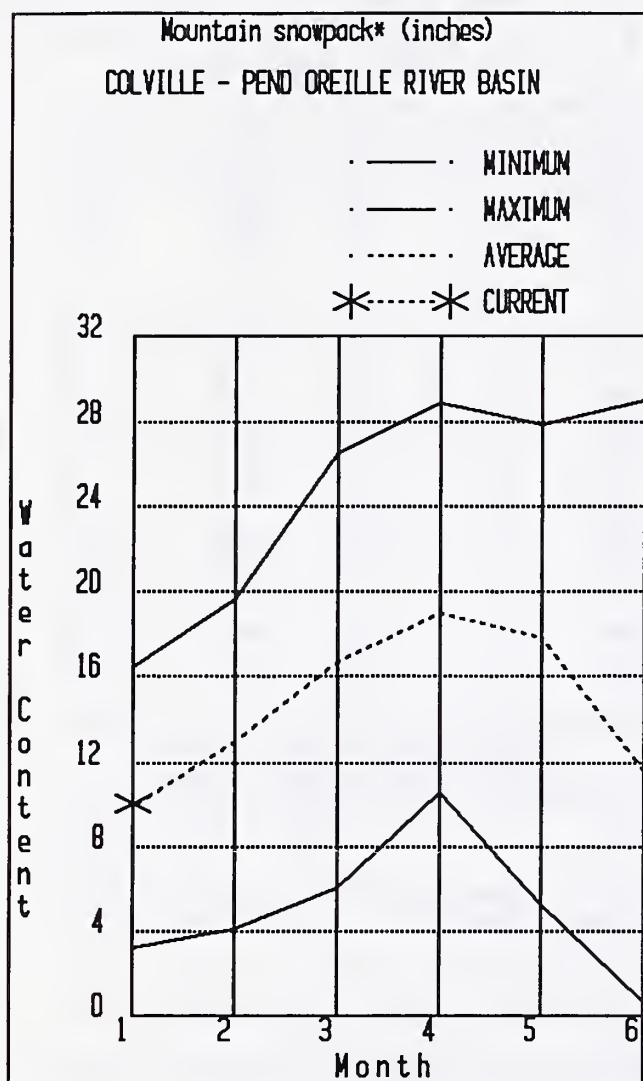
SPOKANE RIVER BASIN Reservoir Storage (1000 AF) - End of December					SPOKANE RIVER BASIN Watershed Snowpack Analysis - January 1, 1993		
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of Last Yr Average
		This Year	Last Year	Avg			
COEUR D'ALENE	238.5	44.5	140.6	130.5	Spokane River	6	118

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Colville - Pend Oreille River Basins



*Based on selected stations

January 1 snow cover is 98% of average on the Pend Oreille, and 111% on the Kettle River. Snowpack at Bunchgrass Meadow SNOTEL site was 10.7 inches of water, the average January 1 reading is 10.9. Precipitation during December was 75% of average, bringing the water year-to-date to 84% of normal. December streamflow was 47% of normal on the Pend Oreille River, 85% on the Columbia at the International Boundary, and 79% on the Kettle River. The forecast for the Kettle River streamflow is 100% of normal, the Pend Oreille, 88%, and the Colville River, 96% of normal for the summer runoff period. Temperatures were six degrees below normal for December.

For more information contact your local Soil Conservation Service office.

COLVILLE - PEND OREILLE RIVER BASINS

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier ----- Future Conditions ----- Wetter ----->>						30-Yr Avg. (1000AF)
		Chance Of Exceeding *						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
PEND OREILLE bl Box Canyon (1,2)	APR-SEP	7720	11200	12800	88	14400	17900	14590
	APR-JUL	7040	10200	11700	87	13200	16400	13380
	APR-JUN	6190	8950	10200	88	11500	14200	11570
CHAMOKANE CK nr Long Lake	MAY-AUG	2.2	6.3	9.1	97	11.9	16.0	9.4
COLVILLE at Kettle Falls	APR-SEP	61	100	126	96	152	191	131
	APR-JUL	55	91	115	96	140	176	120
	APR-JUN	52	85	107	96	129	162	111
KETTLE nr Laurier	APR-SEP	1040	1510	1850	100	2190	2690	1853
	APR-JUL	955	1430	1760	100	2090	2570	1760
	APR-JUN	865	1300	1590	100	1880	2310	1585
COLUMBIA at Birchbank (1,2)	APR-SEP	29000	36200	39400	90	42600	49800	43810
	APR-JUL	23300	29000	31600	90	34200	39900	35140
	APR-JUN	17100	21200	23100	90	25000	29100	25670
COLUMBIA at Grand Coulee Dm (1,2)	APR-SEP	39800	52300	58000	90	63700	76200	64780
	APR-JUL	33600	44000	48800	90	53600	64000	54500
	APR-JUN	26100	34300	38000	89	41700	49900	42730

COLVILLE - PEND OREILLE RIVER BASINS Reservoir Storage (1000 AF) - End of December

COLVILLE - PEND OREILLE RIVER BASINS Watershed Snowpack Analysis - January 1, 1993

Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of -----	
		This Year	Last Year	Avg			Last Yr	Average
ROOSEVELT	5232.0	3744.2	4629.4	4547.9	Colville River	0	0	0
BANKS	715.0	688.2	680.2	618.3	Pend Oreille River	6	99	98
					Kettle River	4	117	111

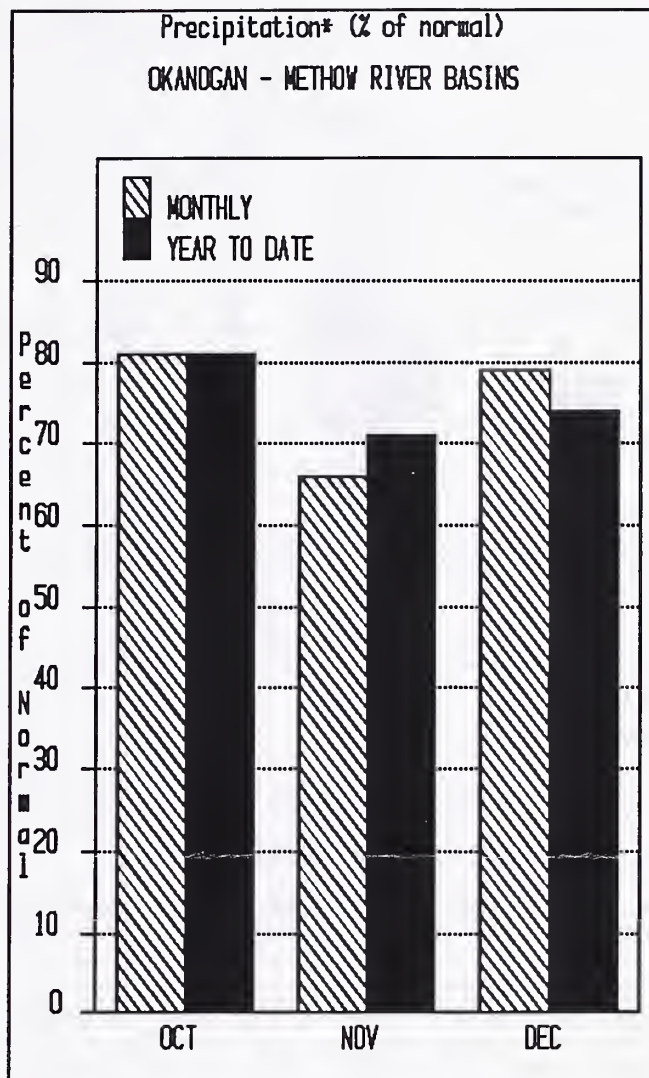
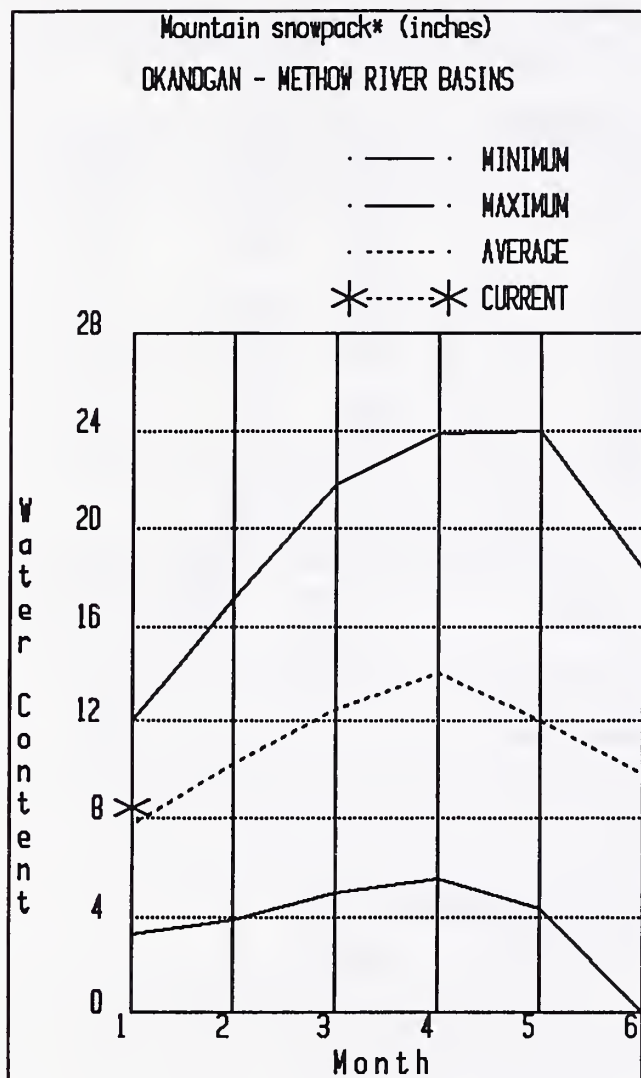
* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.

(2) - The value is natural flow - actual flow may be affected by upstream water management.

Okanogan - Methow River Basins



*Based on selected stations

January 1 snow cover was 114% of average on the Okanogan, 100% on the Methow, and 82% on the Similkameen rivers. December precipitation in the Okanogan-Methow was 79% of normal, with water year-to-date at 74% of average. December streamflow on the Methow River was 78% of normal, 65% on the Okanogan River, and 62% on the Similkameen. Snow water content at the Harts Pass SNOTEL, elevation 6500 feet, was 16.5 inches, normal for this site is 17.9 inches. Summer runoff forecast for the Okanogan River is 86% of normal; the Similkameen River, 89%, and the Methow River, 87% of normal. Temperatures were six degrees below normal for the month. Storage in the Conconully Reservoir is 11,900 acre feet, which is 51% of capacity and 89% of January 1 average.

For more information contact your local Soil Conservation Service office.

OKANOGAN - METHOW RIVER BASINS

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier -----		Future Conditions		----- Wetter ----->>		30-Yr Avg. (1000AF)
		90%	70%	50% (Most Probable)		30%	10%	
		(1000AF)	(1000AF)	(1000AF) (% AVG.)		(1000AF)	(1000AF)	
SIMILKAMEEN nr Nighthawk (1)	APR-SEP	560	1060	1240	89	1420	1920	1399
	APR-JUL	640	1000	1160	89	1320	1680	1304
	APR-JUN	600	870	990	89	1110	1380	1113
OKANOGAN RIVER nr Tonasket (1)	APR-SEP	535	1160	1390	86	1620	2240	1624
	APR-JUL	610	1060	1260	86	1460	1910	1467
	APR-JUN	565	905	1060	86	1210	1560	1234
METHOW RIVER nr Pateros (1)	APR-SEP	285	635	815	87	995	1370	942
	APR-JUL	215	590	760	87	930	1300	873
	APR-JUN	200	515	655	88	795	1110	746

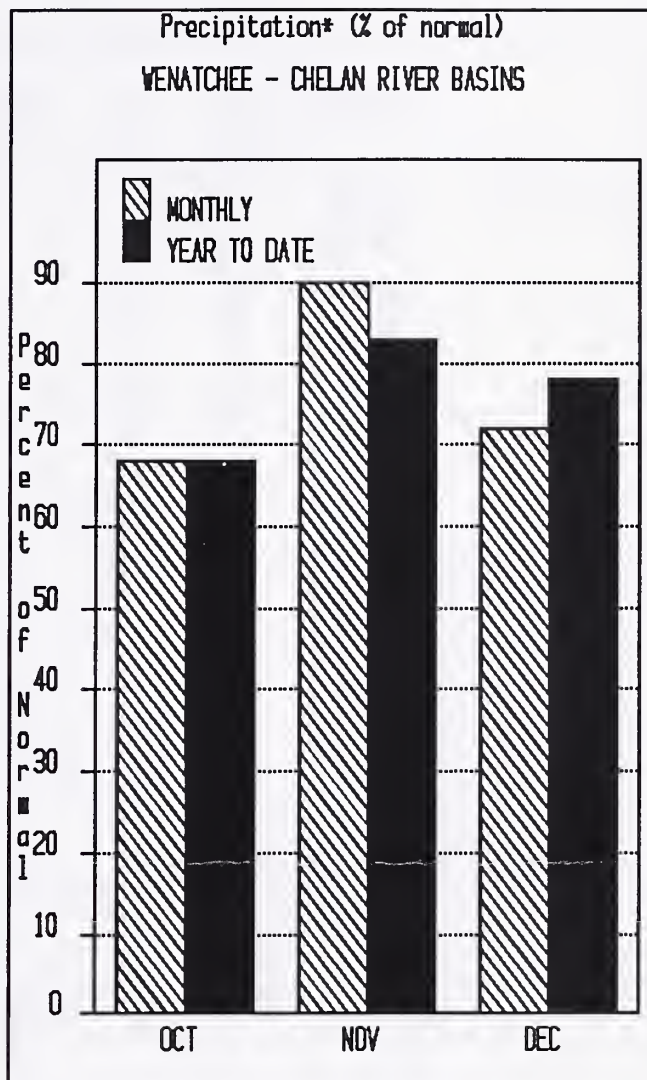
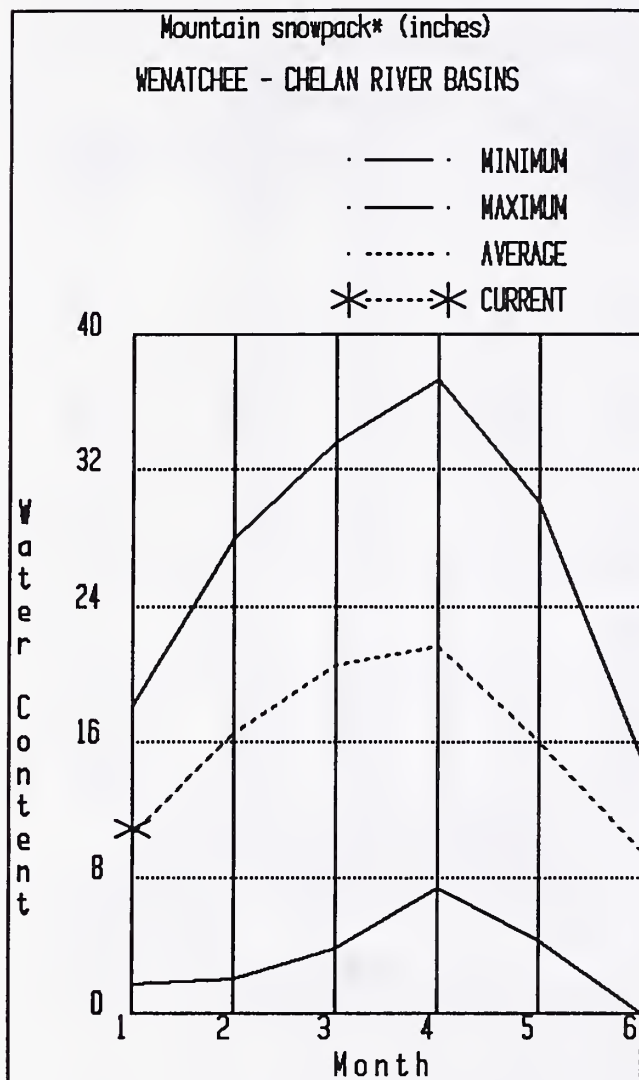
OKANOGAN - METHOW RIVER BASINS Reservoir Storage (1000 AF) - End of December					OKANOGAN - METHOW RIVER BASINS Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
CONCONULLY LAKE (SALMON)	10.5	7.3	8.2	7.5	Okanogan River	12	123	111
CONCONULLY RESERVOIR	13.0	4.6	7.0	5.9	Methow River	2	83	100

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Wenatchee - Chelan River Basins



*Based on selected stations

January 1 snowpack in the Wenatchee Basin is 104% and the Chelan Basin 96%. Snowpack along Colockum Ridge is near normal for the first time in five years, with Stemilt Creek at 97%. Reservoir storage in Lake Chelan is 335,700 acre feet or 89% of January 1 average and 50% of capacity. Lyman Lake SNOTEL had the most snow water with 23.4 inches of water, this site would normally have 25.4 inches. Runoff for the Entiat River is forecast to be 88% of normal for the summer. Summer forecasts for the Chelan River is for 88%, for the Wenatchee River it is 91%, and 93% on the Squilchuck - Stemilt. Streamflow for December on the Chelan River was 61% of average and on the Wenatchee River it was 80% of normal. Precipitation during December was 72% of normal in the basin and 78% for the year to date.

For more information contact your local Soil Conservation Service office.

WENATCHEE - CHELAN RIVER BASINS

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier ----- Future Conditions ----- Wetter ----->>						
		Chance Of Exceeding *						30-Yr Avg. (1000AF)
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF) (% AVG.)		30% (1000AF)	10% (1000AF)	
CHELAN RIVER at Chelan (1)	APR-SEP	625	880	1020	88	1160	1420	1160
	APR-JUL	510	780	900	88	1020	1290	1024
	APR-JUN	410	620	715	88	810	1020	812
STEHEKIN R. at Stehekin	APR-SEP	540	665	750	91	835	990	827
	APR-JUL	465	570	640	91	710	815	701
	APR-JUN	355	435	490	91	545	625	538
ENTIAT RIVER nr Ardenvoir	APR-SEP	131	172	200	88	230	270	227
	APR-JUL	114	153	180	87	205	245	206
	APR-JUN	98	128	149	88	170	200	169
WENATCHEE R. at Peshastin	APR-SEP	865	1250	1490	91	1730	2110	1636
	APR-JUL	810	1130	1350	91	1570	1890	1485
	APR-JUN	665	925	1100	91	1280	1530	1204
STEMILT nr Wenatchee (miners in)	MAY-SEP	79	108	128	93	148	177	138
ICICLE CREEK nr Leavenworth	APR-SEP	225	300	355	96	410	485	370
	APR-JUL	205	275	325	96	375	445	340
	APR-JUN	164	220	260	96	300	355	270
COLUMBIA R. bl Rock Island Dam (2)	APR-SEP	43500	55500	63600	90	71700	83700	70410
	APR-JUL	36900	47000	53900	90	60800	70900	59690
	APR-JUN	29000	36900	42300	90	47700	55600	46980

WENATCHEE - CHELAN RIVER BASINS Reservoir Storage (1000 AF) - End of December					WENATCHEE - CHELAN RIVER BASINS Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
CHELAN LAKE	676.1	335.7	324.1	378.7	Chelan Lake Basin	3	77	96
					Entiat River	1	80	86
					Wenatchee River	9	111	105
					Squilchuck Creek	0	0	0
					Stemilt Creek	1	127	97
					Colockum Creek	1	192	102

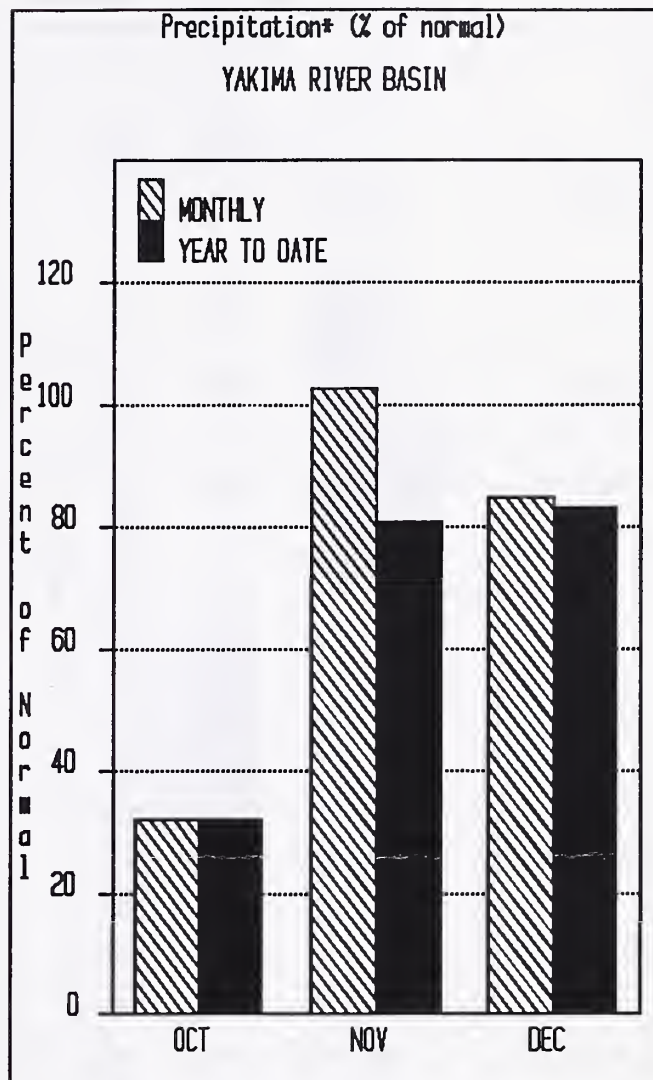
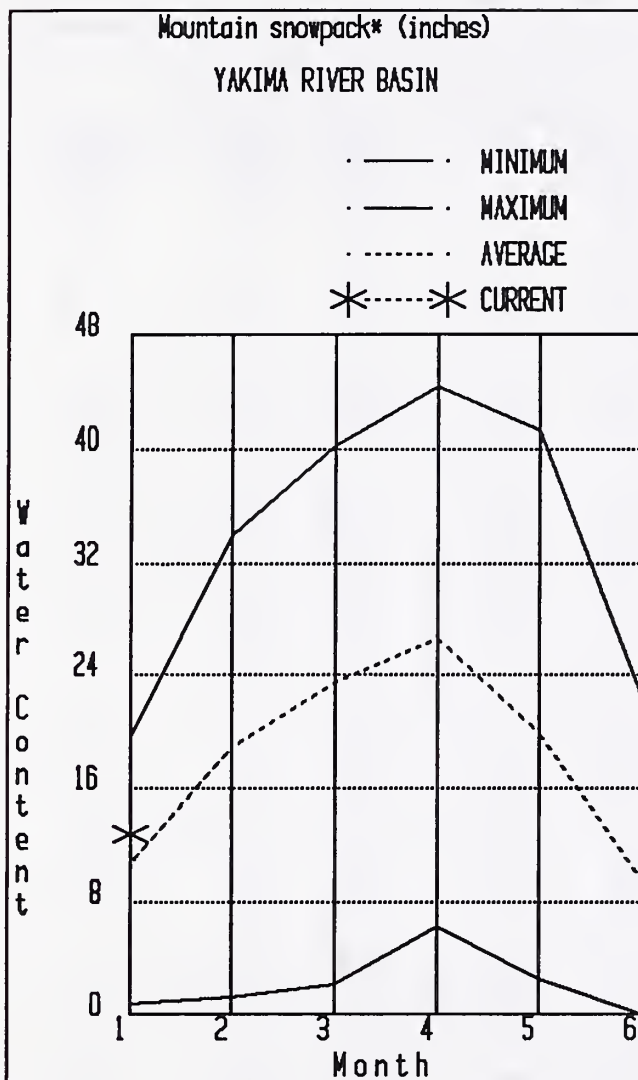
* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.

(2) - The value is natural flow - actual flow may be affected by upstream water management.

Yakima River Basin



*Based on selected stations

January 1 snowpack is 119% based upon 14 snow courses and SNOTEL readings. January 1 summer streamflow forecasts for the Yakima Basin vary throughout the basin as follows: The Yakima River at Cle Elum, 98%; Naches River, 94%; the Yakima River at Parker, 90%, Ahtanum Creek, 88%, and the Tieton River 93%. December streamflows were very low with the Yakima River at Parker 37% of normal, 46% for the Yakima near Cle Elum, and 29% for the Naches River. December precipitation was 85% of normal and 83% for the water year to date. January 1 reservoir storage for the five major reservoirs at 187 100 acre feet, was 32% of average. Temperatures were five degrees below average for December. Volume forecasts for the Yakima Basin are for natural flow. As such, they may differ from the U. S. Bureau of Reclamation's forecast for the total water supply available which includes irrigation return flow.

For more information contact your local Soil Conservation Service office.

YAKIMA RIVER BASIN

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<----- Drier -----		Future Conditions		----- Wetter ----->		30-Yr Avg. (1000AF)
				Chance Of Exceeding *				
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
LAKE KEECHELUS INFLOW	APR-JUL	81	103	118	95	133	155	124
	APR-SEP	97	112	128	95	144	159	135
	APR-JUN	74	91	103	94	115	133	109
KACHESS LAKE INFLOW	APR-JUL	71	91	105	95	119	139	111
	APR-SEP	83	97	112	95	127	142	118
	APR-JUN	68	84	95	96	106	122	99
CLE ELUM LAKE INFLOW	APR-JUL	295	360	400	98	440	505	409
	APR-SEP	315	395	440	98	485	540	448
	APR-JUN	255	305	335	97	365	415	345
YAKIMA RIVER at Cle Elum	APR-JUN	500	610	680	94	750	860	721
	APR-JUL	560	690	780	94	870	1000	832
	APR-SEP	660	765	860	94	955	1050	915
BUMPING RIVER nr Nile (1)	APR-SEP	79	110	127	93	144	175	136
	APR-JUL	66	100	115	93	130	164	124
	APR-JUN	56	84	97	93	110	138	104
AMERICAN RIVER nr Nile	APR-SEP	71	92	107	91	122	143	118
	APR-JUL	66	86	99	91	113	132	109
	APR-JUN	56	73	84	91	95	112	92
TIETON RIVER at Tieton (1)	APR-SEP	135	191	220	93	250	305	237
	APR-JUL	106	161	186	93	210	265	200
	APR-JUN	85	130	150	93	170	215	162
NACHES RIVER nr Naches (2)	APR-SEP	510	670	780	94	890	1060	832
	APR-JUL	465	610	710	94	810	955	755
	APR-JUN	400	525	610	94	695	820	651
AHTANUM CREEK nr Tampico (2)	APR-SEP	19.0	32	40	87	49	61	46
	APR-JUL	18.0	29	37	88	45	56	42
	APR-JUN	16.0	25	32	89	39	49	36
YAKIMA RIVER nr Parker (2)	APR-SEP	1170	1540	1790	90	2040	2410	1994
	APR-JUL	1070	1400	1620	90	1840	2170	1805
	APR-JUN	950	1240	1440	90	1640	1930	1597

YAKIMA RIVER BASIN Reservoir Storage (1000 AF) - End of December					YAKIMA RIVER BASIN Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
KEECHELUS	157.8	34.8	80.1	83.0	Yakima River	14	132	119
KACHESS	239.0	47.2	129.5	159.1	Ahtanum Creek	2	202	150
CLE ELUM	436.9	56.5	224.9	230.2				
BUMPING LAKE	33.7	4.2	6.6	6.3				
RIMROCK	198.0	44.4	64.3	102.1				

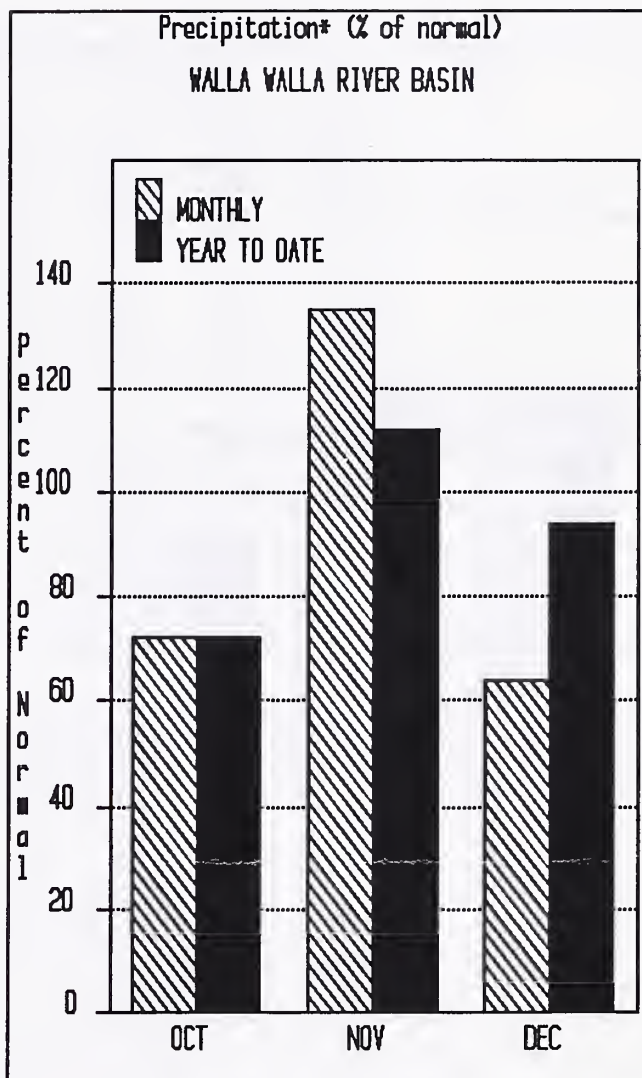
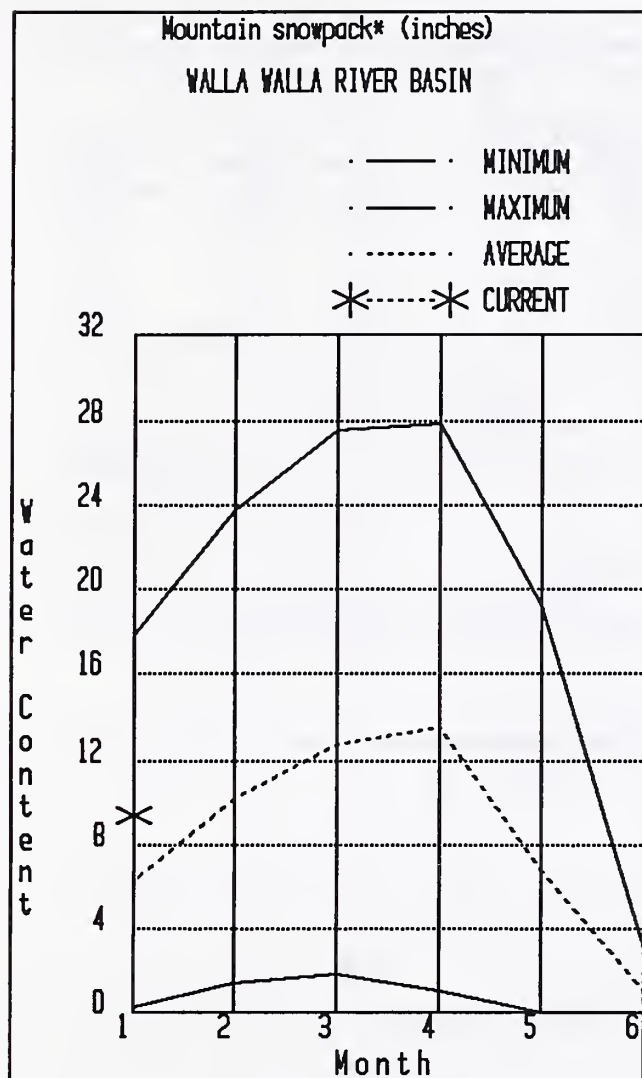
* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.

(2) - The value is natural flow - actual flow may be affected by upstream water management.

Walla Walla River Basin



*Based on selected stations

January 1 snowpack is at 149% of normal. The Touchet SNOTEL site has 17.6 inches of water, the normal January 1 reading for this site is 12.9 inches. December precipitation was 64% of average, bringing the year to date precipitation to 94% of normal. SNOTEL sites are showing a year to date precipitation of 115% of average. The forecast is for 85% of average streamflow in the Walla Walla River for the coming summer, the Grande Ronde, 99%; Snake River, 85%, and 93% for Mill Creek. December streamflow was 27% of normal on the Walla Walla River, 53% for the Snake River, and 44% on the Grande Ronde River near Troy. Temperatures were two degrees below average for December.

For more information contact your local Soil Conservation Service office.

WALLA WALLA RIVER BASIN

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier -----		Future Conditions		----- Wetter ----->>		30-Yr Avg. (1000AF)
		90%	70%	50% (Most Probable)	Chance Of Exceeding *	30%	10%	
		(1000AF)	(1000AF)	(1000AF)	(% AVG.)	(1000AF)	(1000AF)	
SNAKE bl Lower Granite Dam (1,2)	APR-JUL	7580	14900	18300	85	21700	29200	21650
	APR-SEP	8530	16800	20600	85	24400	32800	24360
MILL CREEK at Walla Walla	APR-SEP	6.1	11.9	15.9	93	19.9	26	17.1
	APR-JUL	5.9	11.7	15.7	93	19.7	26	16.9
	APR-JUN	5.9	11.7	15.6	93	19.5	25	16.7

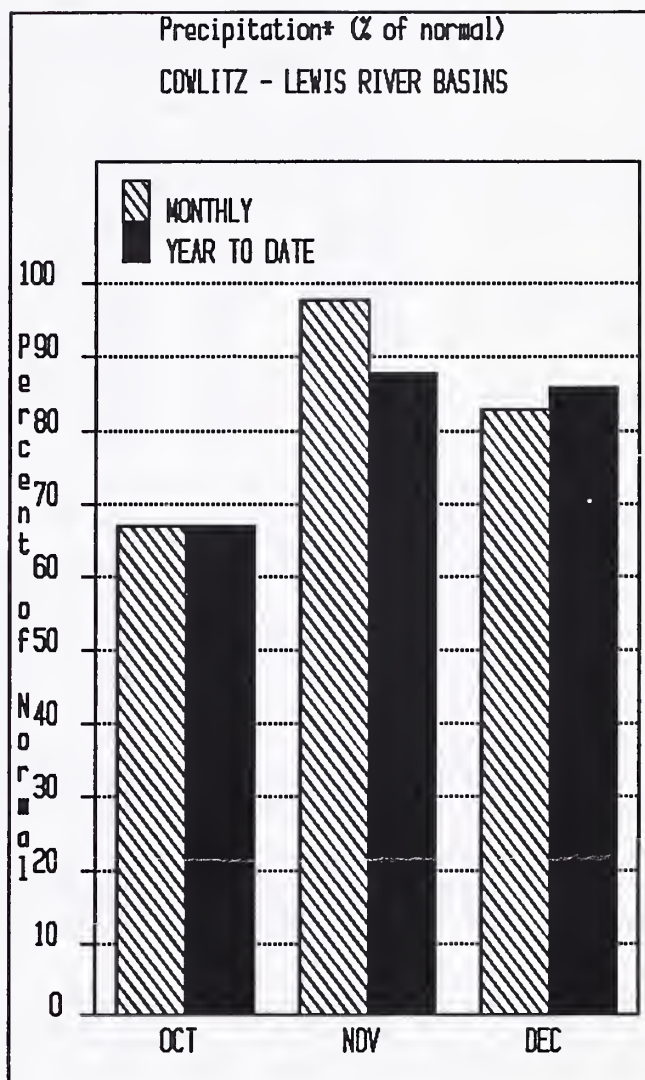
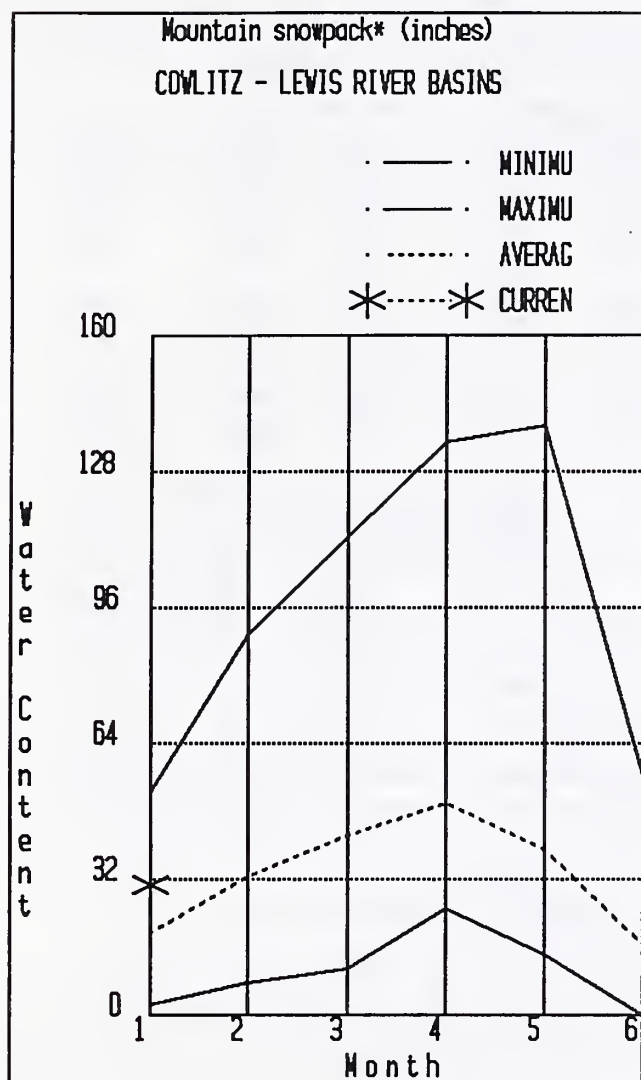
WALLA WALLA RIVER BASIN Reservoir Storage (1000 AF) - End of December					WALLA WALLA RIVER BASIN Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					Mill Creek	2	134	149

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Cowlitz - Lewis River Basins



*Based on selected stations

January 1 snow cover for the Cowlitz-Lewis River Basin is 160%. The Paradise Park SNOTEL contained the maximum water content for the basin with 31.8 inches of water. Normal January 1 water content is 23.6 inches. Forecasts for summer runoff in the Lewis River are 96%, and for the Cowlitz River, 88%. December streamflow on the Cowlitz River was 42% of average, and 45% on the Lewis River. December precipitation was 83% of normal, bringing the water year-to-date precipitation to 86% of average. Temperatures were two degrees below normal for December.

For more information contact your local Soil Conservation Service office.

COWLITZ - LEWIS RIVER BASINS

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier ----- Future Conditions ----- Wetter ----->>					
		Chance Of Exceeding *				30-Yr Avg.	
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)
LEWIS RIVER at Ariel (2)	APR-SEP	420	950	1160	96	1370	1890
	APR-JUL	560	825	1010	96	1190	1460
	APR-JUN	500	740	900	96	1060	1300
COWLITZ R. bl Mayfield Dam (2)	APR-SEP	355	1360	1730	88	2100	3090
	APR-JUL	725	1200	1520	88	1840	2320
	APR-JUN	620	1020	1300	88	1580	1980
COWLITZ R. at Castle Rock (2)	APR-SEP	425	2060	2330	87	2600	4240
	APR-JUL	1440	1780	2020	87	2260	2600
	APR-JUN	1240	1540	1740	87	1940	2240

COWLITZ - LEWIS RIVER BASINS Reservoir Storage (1000 AF) - End of December					COWLITZ - LEWIS RIVER BASINS Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					Cowlitz River	6	156	145
					Lewis River	4	292	182

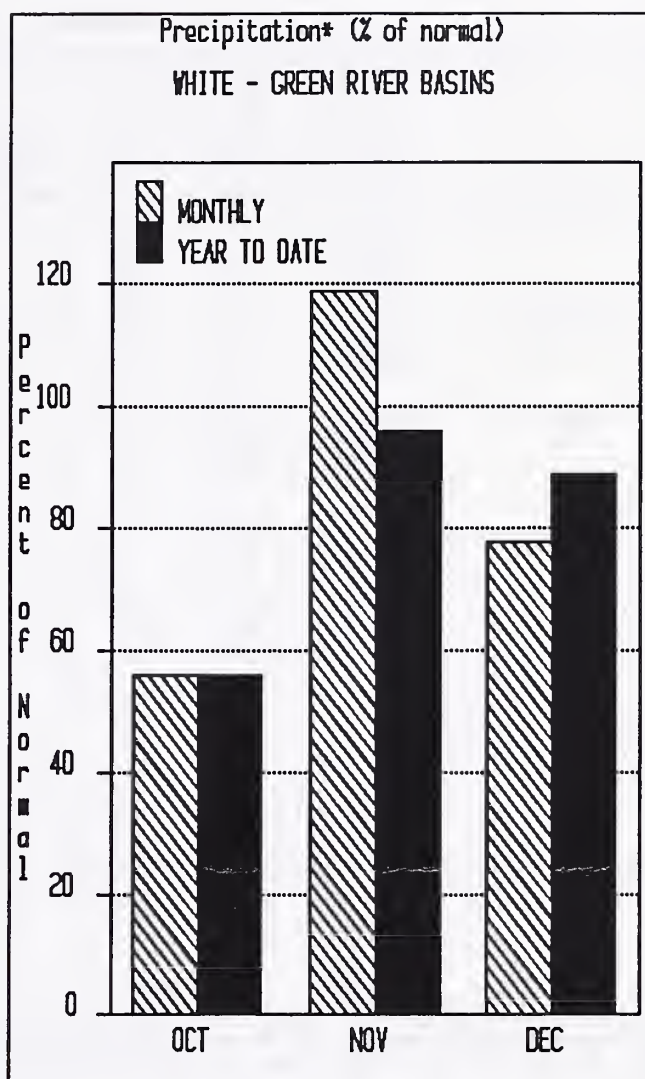
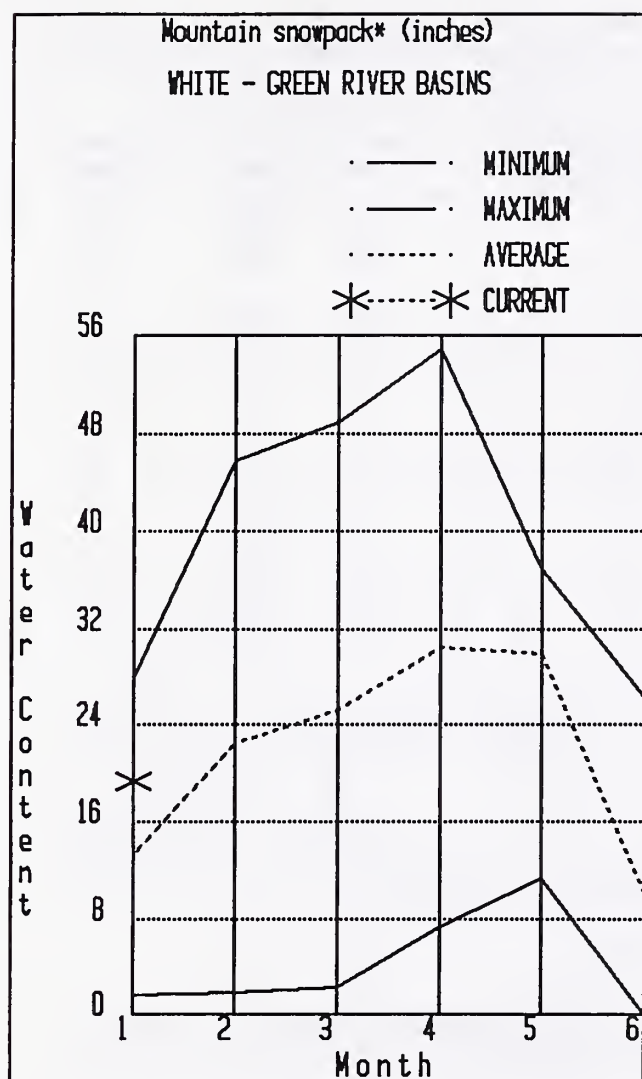
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The average is computed for the 1961-1990 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.

(2) - The value is natural flow - actual flow may be affected by upstream water management.

White - Green River Basins



*Based on selected stations

January 1 snowpack was 116% of normal in the White River Basin and 160% in the Green River Basin. Water content on January 1 at the Stampede Pass SNOTEL, at an elevation of 3860 feet, was 23.7 inches. This site has a January 1 average of 16.7 inches. December precipitation was 78% of normal, bringing the water year to date to 89% of average. Summer runoff is forecasted to be 91% on the Green River and 94% on the Cedar River. New forecast points have been added to the tables and include the Rex River at 96%, the South Fork of the Tolt River at 98% and the Cedar River at Cedar, 96%. Temperatures were two degrees below average for December.

For more information contact your local Soil Conservation Service office.

WHITE - GREEN RIVER BASINS

Streamflow Forecasts - January 1, 1993

		<<----- Drier ----- Future Conditions ----- Wetter ----->>						
Forecast Point	Forecast Period	Chance Of Exceeding *						30-Yr Avg. (1000AF)
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF) (% AVG.)		30% (1000AF)	10% (1000AF)	
GREEN RIVER below Howard Hanson Dam	APR-JUL	165	205	235	91	265	305	257
	APR-SEP	177	225	260	91	295	345	285
	APR-JUN	154	191	215	92	240	275	234
CEDAR RIVER near Cedar Falls	APR-JUL	45	61	72	94	83	99	77
	APR-SEP	49	67	79	93	91	109	85
	APR-JUN	46	57	64	94	71	82	68
REX RIVER nr Cedar Falls	APR-JUL	15.0	22	26	96	30	37	27
	APR-SEP	17.0	24	29	97	34	41	30
	APR-JUN	15.0	20	23	92	26	31	25
CEDAR RIVER at Cedar Falls	APR-JUL	34	61	79	96	97	124	82
	APR-SEP	32	61	80	96	99	128	83
	APR-JUN	40	62	77	96	92	114	80
SOUTH FORK TOLT RIVER near Index	APR-JUL	11.5	13.5	14.9	98	16.3	18.3	15.2
	APR-SEP	13.3	15.7	17.4	98	19.1	22	17.8
	APR-JUN	9.7	11.5	12.8	98	14.1	15.9	13.1

WHITE - GREEN RIVER BASINS Reservoir Storage (1000 AF) - End of December					WHITE - GREEN RIVER BASINS Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					White River	2	106	116
					Green River	6	191	164
					Cedar River	0	0	0

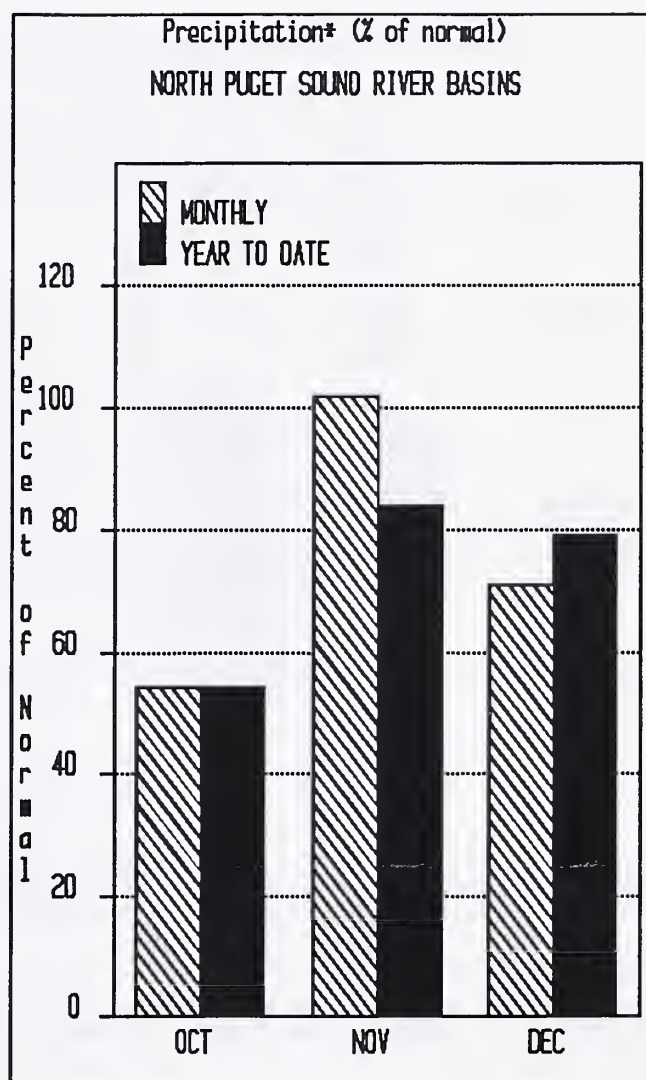
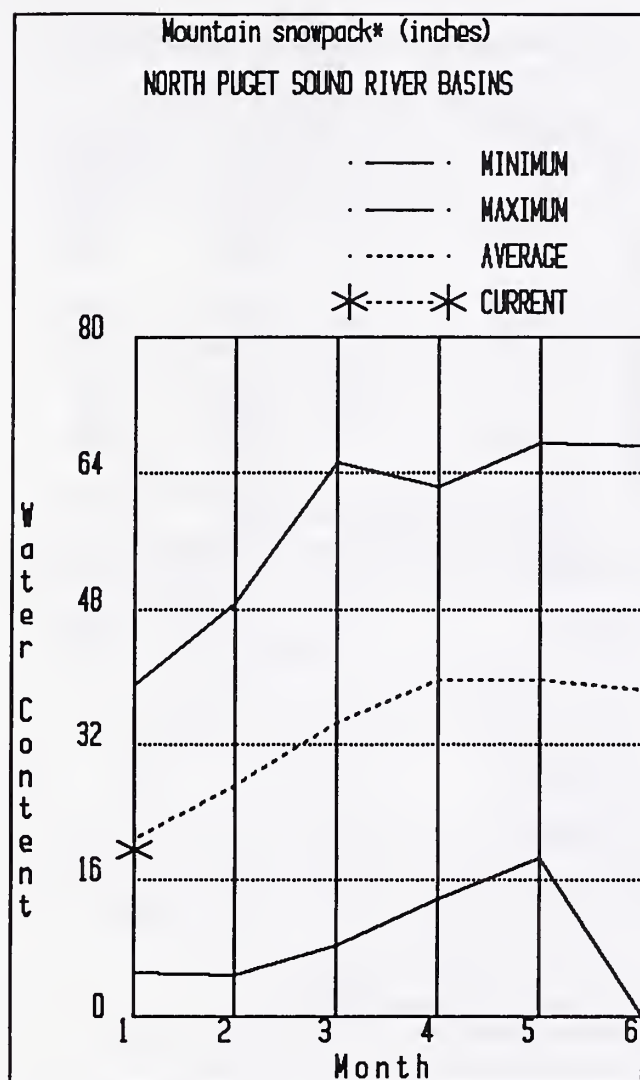
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North Puget Sound River Basins



*Based on selected stations

January 1 snow cover in the Skagit Basin is 94% of normal. Rainy Pass SNOTEL at elevation 4780 feet, has 15.5 inches of water content; normal January 1 water content is 15.4 inches. January 1 reservoir storage is below average, with Ross Lake reservoir at 87% of normal and 49% of capacity. December streamflow in the Skagit River was 46% of average. Forecast for the Skagit River streamflow is 94% of normal for the spring and summer period. New forecast points have been added to the tables with the Baker River at 88% and Thunder Creek at 91%. Precipitation for December was 71% of average with a water year to date at 79% of normal. December temperatures were two degrees below normal.

For more information contact your local Soil Conservation Service office.

NORTH PUGET SOUND RIVER BASINS

Streamflow Forecasts - January 1, 1993

Forecast Point	Forecast Period	<<----- Drier ----- Future Conditions ----- Wetter ----->>						30-Yr Avg. (1000AF)
		----- Chance Of Exceeding * -----						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
THUNDER CREEK near Newhalem	APR-JUL	178	197	210	91	225	240	230
	APR-SEP	260	285	300	91	315	340	328
	APR-JUN	105	123	135	91	147	165	149
SKAGIT RIVER at Newhalem (2)	APR-SEP	1470	1810	2050	94	2290	2630	2185
	APR-JUL	1230	1520	1720	94	1920	2210	1830
	APR-JUN	950	1170	1320	94	1470	1690	1410
BAKER RIVER near Concrete	APR-JUL	575	675	740	89	805	905	836
	APR-SEP	755	865	940	88	1020	1130	1064
	APR-JUN	410	485	540	88	595	670	611

NORTH PUGET SOUND RIVER BASINS Reservoir Storage (1000 AF) - End of December					NORTH PUGET SOUND RIVER BASINS Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
ROSS	1404.1	681.8	1161.5	783.9	Snoqualmie River	1	140	110
DIABLO RESERVOIR	90.6	85.6	87.1	---	Skykomish River	3	116	128
GORGE RESERVOIR	9.8	8.0	7.9	---	Skagit River	3	77	94
					Baker River	0	0	0

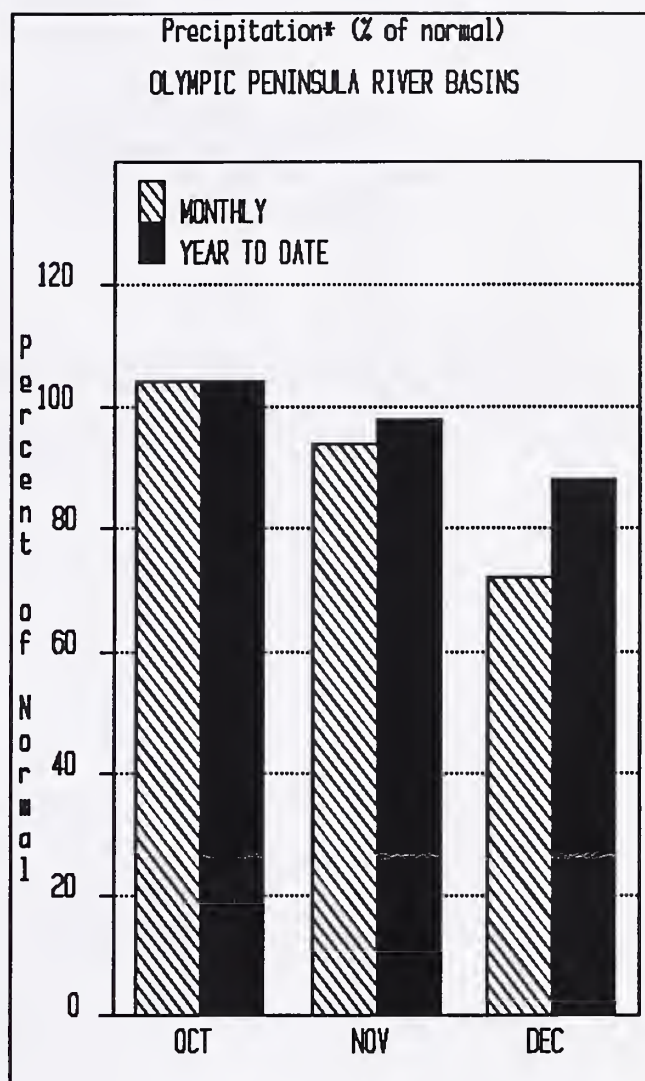
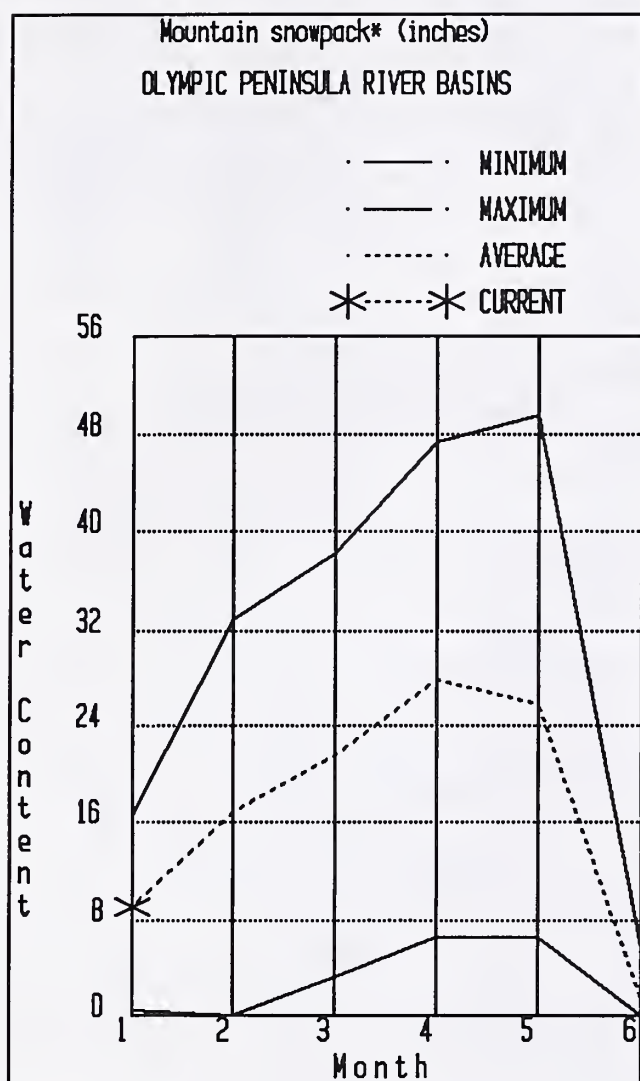
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(2) - The value is natural flow - actual flow may be affected by upstream water management.

Olympic Peninsula River Basins



*Based on selected stations

January 1 snow cover in the Olympic Basin is below normal based on data from the Mount Crag SNOTEL. The Mount Crag SNOTEL near Quilcene had 13.2 inches on January 1, last year it had 4.9 inches. January forecasts of runoff for streamflow in the basin are for 92% of average on the Dungeness River and the Elwha River, 95%. The Big Quilcene can expect normal runoff this summer. December precipitation was 72% of average, with water year-to-date precipitation accumulation at 88% of normal. December precipitation at Quillayute was 9.79 inches. Temperatures were two degrees below normal for December.

For more information contact your local Soil Conservation Service office.

OLYMPIC PENINSULA RIVER BASINS

Streamflow Forecasts - January 1, 1993

		<<----- Drier ----- Future Conditions ----- Wetter ----->>						
Forecast Point	Forecast Period	----- Chance Of Exceeding * -----						30-Yr Avg. (1000AF)
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF) (% AVG.)		30% (1000AF)	10% (1000AF)	
DUNGENESS RIVER nr Sequim	APR-SEP	115	134	147	92	160	179	160
	APR-JUL	95	111	121	92	131	147	131
	APR-JUN	71	82	90	92	98	109	98
ELWHA RIVER nr Port Angeles	APR-SEP	365	430	475	95	520	585	502
	APR-JUL	310	365	400	96	435	490	417

OLYMPIC PENINSULA RIVER BASINS Reservoir Storage (1000 AF) - End of December					OLYMPIC PENINSULA RIVER BASINS Watershed Snowpack Analysis - January 1, 1993			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					Elwha River	0	0	0
					Morse Creek	0	0	0
					Dungeness River	0	0	0
					Quilcene River	0	0	0
					Wynoochee River	0	0	0

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural flow - actual flow may be affected by upstream water management.

In addition to basin outlook reports, a Water Supply Forecast for the Western United States is published by the Soil Conservation Service and National Weather Service monthly, January through May. Reports may be obtained from the Soil Conservation Service, West National Technical Center, 511 Northwest Broadway, Room 248, Portland, OR 97209-3489.

Issued by

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U.S. Department of Agriculture

Released by

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The Following Organizations Cooperate With The Soil Conservation Service In Snow Survey Work

Canada:	Ministry of the Environment, Water Investigations Branch, Victoria, British Columbia
States:	Washington State Department of Ecology Washington State Department of Natural Resources
Federal:	Department of the Army Corps of Engineers U.S. Department of Agriculture Forest Service U.S. Department of Commerce NOAA, National Weather Service U.S. Department of the Interior Bonneville Power Administration Bureau of Reclamation Geological Survey National Park Service Bureau of Indian Affairs
Local:	City of Tacoma City of Seattle Chelan County P.U.D. Pacific Power and Light Company Puget Sound Power and Light Company Washington Water Power Company Snohomish County P.U.D. Colville Confederated Tribes Spokane County Yakima Indian Nation
Private:	Okanogan Irrigation District Wenatchee Heights Irrigation District Newman Lake Homeowners Association

Other organizations and individuals furnish valuable information for snow survey reports. Their cooperation is gratefully acknowledged.



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Washington Basin Outlook Report

Soil Conservation Service
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